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adds that the lamented Agassiz stated on one occasion that if ever a perfect jaw of these ancient, extinct Cestracionts should be discovered, it would be found that several species now separated constitute but one. Thus ever true to nature was this great naturalist. He finds that these Cestraciont jaws throw much light on the earliest fossil fish, and the lowest type of fish of the present day. The affinities in this case are so different from what was previously known, that he has considered it a new genus and named it after Prof. Agassiz — Agazodus.

The most remarkable species of fish which we have found, the present season, are of a genus new to me, and I think to science. They are armed with a long, strong weapon at the extremity of the upper jaw, something like that of a sword-fish, but round and pointed and composed of strong fibres. The jaws are provided with three kinds of teeth. On the outer edge is a row of large, flat, cutting teeth, somewhat resembling those of a shark. Inside, and placed irregularly, are small, blunt teeth; while in the back portion of the palate is the third set—small, sharp and needle-like in shape, forming a pavement. The jaws are also fibrous, like the snout. There are three species of this genus. Prof. Marsh has them for critical scientific examination.

REPORT ON BOTANY, 1874.

BY JAMES H. CARRUTH.

It would be very queer if, when we gave a man's name, we were obliged to give also the name of the person who gave him his name. But this is the way—I suppose properly—in Botany, and I have to acknowledge not having attended to this in my reports hitherto. Nor can I do it throughout in the present. If, at a future day, I am able to embody all the reports in one, I will try to do it.

I have not done much in the field the past year—partly from the pressure of other duties, but more because I have had my hands full of indoor work in this department, as will appear. Had I had more time, only the gleanings remained in Douglas county.

Last spring I sent to several persons copies of the reports already published, asking them to collect specimens of rare species, and also to make lists of such as they found, not already published.

The additions this year have come largely in this way. Prof. Snow, with the help of his students and correspondents, has furnished

more than twenty. Miss M. P. Wright, of Burlington, has brought me specimens of three—two of them common at the east, but not hitherto found in Kansas. Miss E. C. Wright, living near Irving, Marshall county, has sent me a list of forty or fifty, of which she feels certain, but her specimens have been accidentally spoiled. Mr. E. A. Popenoe, of Topeka, has made a trip to Western Kansas, and has given me a list of more than forty found there and at home. Dr. L. Watson, of Ellis, has sent me plants all summer—more than I have found time to analyze. Indeed, the plants of Western Kansas are so different from those east of the Mississippi—the field of Wood and Gray—that I could not have done much with them, had not Dr. W. kindly put me in the way to get Porter & Coulter's *Flora of Colorado*; and even with this aid, the work has been slow, because dried specimens, especially of small plants, are much more difficult to analyze than fresh ones. Stamens and pistils often afford no aid, and the form of the flower is often spoiled. Still I think I have succeeded with most that I have tried, and am very sorry that I could not have tried all. If I or those who have reported to me have made mistakes, we will try to have all made right in the final summing up.

Our previous lists have made over 800. The lists given me this year are in part the same, but make in all about 140 different ones. Porter & Coulter give, as the result of the observations of some six to ten botanists in Colorado, about 1,050 species, including the lilies and one or two other small orders of cryptogamia. Mr. N. Colman has published a *Flora of Southern Michigan*, and his catalogue contains 1,375 copies, including as above.

Prof. Wood's *Class Book* describes about 3,900 species growing east of the Mississippi, a large proportion being found in the South Atlantic and Gulf States.

In view of these facts, I think we may expect to find in Kansas about 1,200 species. I have mentioned Porter & Coulter. I would recommend to Kansas botanists, specially at the west, to procure their work. It may be had by writing to the Department of the Interior, and sending a dime or two to pay postage. The species not in Gray's *Manual* are described fully. Generic descriptions, outside of Gray, are also given. The genera not in Gray are 94, and the species over 600.

The tendency is quite strong of late to consider some forms of plants which have been hitherto regarded as species as only varieties. I think it will require long and close observation to determine some questions of this kind. Animals in their wild state, are but little

inclined to run into varieties. Domestic animals, much. It seems to be so with plants. If wild species vary, why should we not expect to find "grades" indefinitely, as among uncultivated ones? To me it seems that however close the resemblance between two forms, if they do not graduate into each other, but remain distinct in the neighborhood of each other, they should be regarded as species. Botanically the most obvious difference between the apple and the pear, is in the fruit. Apples are globular, oblate, prolate and conical, but never *ob*-conical, the form of the pear. Even an intermediate form might be a hybrid, and would not prove the other two to be only varieties. Among animals, hybrids rarely occur without the agency of man. Why should we not expect that, where fertilization depends on the wind or the position of the stamens and pistils, hybridization should be extremely rare? But when it depends on insects or Mr. Rogers, it should be more common.

An interesting article on hybridization and crossbreeding may be found in the Report of the Department of Agriculture for 1867.

Bearing on the same subject is a little experiment of mine. In 1870, I planted seed of a small winter squash.— name not known— oblong, fluted, dark green or orange, or partly both, about five inches long, and three or four in diameter. One or two of the resulting plants bore squashes of the same form, but twice as large, and of the color of the scalloped flat summer squash. I regarded them as hybrids, and wanted to see if the seeds would vegetate. The next year I planted them, and they came up well and bore, but every squash was like the oblong parent.

I have several times tried to raise pawpaws, planting the seed in the fall without drying, both in and out of the fruit, but without success. Last spring, I tried the plan recommended for the Osage orange. I took seed that had been buried during the winter, soaked them two or three weeks, changing the water, planted them in a shady place, and watered them often. They waited so long that I despaired of them, but in June or July they appeared.

I have raised mulberries from seed by washing the seed soon after it was ripe, planting it in a shady place in earth not clayey, and watering it every evening. It came up in about ten days.

I have this year found the artichoke, *Helianthus tuberosus*, growing spontaneously in my garden. Last year I tried to analyze it, but failed because the *Helianthus tuberosus* being called an exotic, in both Wood and Gray, I passed it by.

H. lenticularis, said by Mr. Hall to grow in Kansas, I have not recognized till this year, because I had no description of it. I now find it abundant. It is one of the few that have a brown disk.

Hitherto, so far as I know, no representative of the large order Ericaceæ has been found in Kansas. This year one, the *Monotropa uniflora*, or ghost flower, has been found at Vinland, by Miss Sarah Cutter.

Plants not in Gray's Manual nor Wood's Class Book, are marked thus *

CATALOGUE OF PLANTS.

- RANUNCULACEÆ.
Clematis, Virgin's Bower.
 * *C. Fremontii* Ellis. Watson.
Aquilegia, Columbine.
 * *A. brevistylis*? Fruit and flowers not seen. Lawrence. Snow.
Ranunculus, Crowfoot.
R. aquatilis L. Ellis. Watson.
- NYMPHÆACEÆ.
Nuphar, Yellow Pond Lily.
N. advena Ait. Burlington. Miss M. P. Wright.
- PAPAVERACEÆ.
Sanguinaria, Blood-root.
S. Canadensis L. Ft. Leavenworth. Lieut. Wilcox.
- CRUCIFERÆ.
Arabis, Rock Cress.
A. Thaliana L. Between Lawrence and Topeka. Also Ellis. Watson.
Erysimum, False Wall Flower.
E. cheiranthoides L. Irving. Miss E. C. Wright.
Camelina, False Flax.
C. sativa Crantz. Fruit and flowers not seen. Lawrence, Snow. Topeka, Popenoe.
- VIOLACEÆ.
Viola, Violet.
 * *V. Nuttallii* Ph. Ellis. Popenoe.
- CARYOPHYLLACEÆ.
Paronychia, Nailwort.
P. dichotoma Nutt. Ellis. Watson.
- MALVACEÆ.
Sida.
S. alcaëoides Mx. (Calirrhoe Gray.) Burlington. Miss M. P. W.
- LINACEÆ.
Linum, Flax.
L. rigidum Ph. W. Kansas, Popenoe. Also Ellis, Watson.
- ZYGOPHYLLACEÆ.
Kallstroemia.
K. maxima (Tribulus L.) Dodge. Popenoe.
- LEGUMINOSÆ.
Cassia, Senna.
C. nictitans L. Ft. Leavenworth. Lieut. Wilcox.
- Lespedeza, Bush Clover.
 * *L. angustifolia* Ellis. Watson.
- Psoralea.
 * *P. digitalis* Nutt. Atchison. Popenoe.
 * *P. lanceolata* Ph. Ellis. Watson.
 * *P. cuspidata* Ph. Ellis. Watson.
- Dalea.
 * *D. laxiflora* Ph. W. Kansas, Popenoe; also Ellis, Watson.
 * *D. aurea*. Salina. J. Henry.
- Hosackia.
 * *H. Purshiana*. Salina. J. Henry.
- Petalostemon.
P. carneum Mx. Irving. Miss E. C. Wright.
- Astragalus.
 * *A. Shortii* Nutt. Ext. W. Kansas, Popenoe.
 * *A. bisulcatus*, Gr. Ext. W. Kansas, Popenoe. Ellis, Watson.
 * *A. Parryi* Gr. Ellis. Watson.
 * *A. leptaleus* Gr. Ellis. Watson.
 * *A. racemosus* Ph. Ellis. Watson.
 * *A. Missouriensis* Nutt. Ellis. Watson.
- Wistaria.
W. frutescens D. C. Irving. Miss E. C. W.
- Phaseolus, Bean.
P. helvolus L. Irving. Miss E. C. W.
- ROSACEÆ.
Prunus, Plum, Cherry.
P. Virginiana D. C. Irving. Miss E. C. W.
P. pumila Mx. Ellis. Watson.
- Amelanchier, Juneberry.
A. Canadensis T. and G. Atchison county. Miss E. C. W.
- Cratægus, Thorn.
C. tomentosa L. Lawrence. Snow.
- Rosa, Rose.
 * *R. Arkansana* Porter. Ellis. Watson.
- ONAGRACEÆ.
Oenothera, Evening Primrose.
 * *E. pinnatifida* Nutt. W. Kansas. Popenoe.
 * *E. Hartwegii* Ellis. Watson.
 * *E. pumila* Ellis. Watson.
 * *E. canescens* Ellis. Watson.
- Gaura.
 * *G. parviflora*.
- CACTACEÆ.
Mamillaria.
M. Nuttallii Eng. var. W. Kansas. Prof. Mudge.

UMBELLIFERAE.

- Chærophylum.
C. procumbens Lam. Lawrence and Topeka.
Popenoe.

CORNACEAE.

- Cornus, Dogwood.
C. stolonifera Mx. Irving. Miss E. C. W.

RUBIACEAE.

- Galium, Bedstraw.
G. circæzans Mx. Salina. J. Henry.
Houstonia, Bluets.
H. angustifolia Mx. Irving. Miss E. C. W.
Also Ellis. Watson.

COMPOSITAE.

- Liatris.
*L. ———. Ellis. Watson.
Eupatorium, Boneset.
E. parviflorum Ell. Irving. Miss E. C. W.
Solidago, Goldenrod.
*S. pumila T. and G. Ellis. Watson.
S. lanceolata Ait. Irving. Miss E. C. W.
S. gigantea Ait. Irving. Miss E. C. W.
Rudbeckia, Cone-flower.
R. laciniata L. Irving. Miss E. C. Wright.
Helianthus, Sunflower.
H. annuus L. Irving. Miss E. C. W.
H. tuberosus L. Lawrence. Also Irving,
Miss E. C. W.

- Actinomeris.
A. helianthoides Nutt. Irving. Miss E. C. W.
Gaillardia.
G. ———. Dodge. Popenoe.
Hymenopappus.
H. tenuifolius Psh. Salina. J. Henry.
Helenium.
H. tanacetifolium. W. Kansas. Popenoe.
Artemisia, Wormwood.
A. frigida Willd. Irving. Miss E. C. W.
A. biennis Willd. Irving. Miss E. C. W.
Senecio, Groundsel.
*S. longiloba. Ellis. Watson.
Cirsium, Thistle.
*C. undulatum. Western Kansas, Popenoe.
Also Salina, Henry.
Lygodesmia.
*L. juncea. Western Kansas. Popenoe.
Mulgedium, Wild Lettuce.
M. floridanum DC. Lawrence. Also Ellis,
Watson.

ERICACEAE.

- Monotropa, Indian Pipe.
M. uniflora Retz. Ellis. Watson.

PRIMULACEAE.

- Androsace.
A. filiformis. Ellis. Watson.
PLANTAGINACEAE.
Plantago, Plantain.
P. pusilla Nutt., Salina. J. Henry.
P. aristata (a dwarf var.) Ellis. Watson.

OROBANCHACEAE.

- Aphyllon.
A. fasciculatum T. & G. Irving. Miss E. C. W.

SCROPHULARIACEAE.

- Pentstemon, Beard-tongue.
P. gracilis Nutt. Lawrence.
Mimulus, Monkey-flower.
M. Jamesii Torr. Irving. Miss E. C. W.
Veronica, Speedwell.
V. Americana Schw. Irving. Miss E. C. W.
Gerardia.
G. purpurea L. Irving. Miss E. C. W.
Castilleja.
C. sessiflora Ph. Salina, J. Henry. Also
Ellis, Watson.

VERBENACEAE.

- Verbena, Vervain.
*V. bipinnatifida. Ellis. Watson.
Lippia.
L. cuneifolia. Dodge. Popenoe.
L. lanceolata. Ellis. Watson.

LABIATEAE.

- Lycopus.
L. Virginicus L. Irving. Miss E. C. W.
Salvia, Sage.
S. angustifolia. Lawrence. Snow.
Scutellaria, Skullcap.
S. lateriflora L. Lawrence. Snow.
*S. racemosa Torr. Ellis. Watson.

BORRAGINACEAE.

- Echinosperrum.
E. lappula. Irving, Miss E. C. W. Also
Lawrence, Snow.

POLEMONIACEAE.

- Phlox.
P. Carolina. Irving. Miss E. C. W.

CONVOLVULACEAE.

- Ipomœa.
I. leptophylla Torr. Hutchinson. Popenoe.
Calystegia.
C. Catesbiana Ph. Irving. Miss E. C. W.
Cuscuta, Dodder.
C. arvensis var. Irving. Miss E. C. W.

ASCLEPIADACEAE.

- Asclepias, Milkweed.
*A. speciosa. Hutchinson. Popenoe.
*A. Jamesii Torr. Ext. W. Kansas. Popenoe.
A. verticillata (a dwarf variety.) Ellis. Wat-
son.

Ensenlia.

- E. albida Nutt. Irving. Miss E. C. W.

POLYGONACEAE.

- Rumex, Dock.
R. verticillatus L. Irving. Miss E. C. W.

CHENOPODIACEAE.

- Chenopodium, Goosefoot.
C. glaucum. Irving. Miss E. C. W.
C. Boscianum. Irving. Miss E. C. W.

AMARANTACEAE.

- Amarantus.
A. blitum L. Lawrence. A common weed described in Eaton, and in the old edition of Wood, but omitted in later editions, and in Gray.

EUPHORBIACEAE.

- Euphorbia, Spurge.
S. obtusata Ph. Irving. Miss E. C. W.
 Croton.
C. ——— undetermined. Ellis. Watson.

CALLITRICHACEAE.

- Callitriche.
C. verna L. Ellis. Watson.
C. autumnalis L. Irving. Miss E. C. W.

PODOSTEMACEAE.

- Podostemum.
P. ceratophyllum Mx. Lawrence.

CERATOPHYLLACEAE.

- Ceratophyllum.
C. demersum L. Ellis. Watson.

CUPULIFERAE.

- Ostrya, Ironwood.
O. Virginica Willd. Fort Leavenworth. F. Van Vliet.

ARACEAE.

- Pistia.
P. Stratiotes L. Ellis. Watson.
 Arisaema.
A. quinatum. Irving. Miss E. C. W.

LILIACEAE.

- Yucca.
Y. angustifolia Ph. W. Kansas. Popenoe.
Y. filamentosa. Salina. J. Henry.

PONTEDERIACEAE.

- Pontederia, Pickerel Weed.
P. cordata. Burlington. Miss M. P. Wright.

JUNCACEAE.

- Juncus.
J. repens Mx. Ellis. Watson.

CYPERACEAE.

- Cyperus, Sedge.
C. erythrorhizos Muhl. Lawrence.
C. dentatus Torr. Lawrence. Snow.
C. Schweinitzii. Lawrence. Snow.

Carex.

- C. Muhlenbergii*. Lawrence. Snow.
C. Schweinitzii. Irving. Miss E. C. W.
C. Pennsylvanica Lam. Irving. Miss E. C. W.
C. argyrantha Tuckerm. Irving. Miss E. C. W.
C. sparganoides Muhl. Irving. Miss E. C. W.
C. setacea Dew. Irving. Miss E. C. W.
C. oxylepis Torr. Irving. Miss E. C. W.
C. blanda Dew. Irving. Miss E. C. W.
C. gracillima Schw. Irving. Miss E. C. W.
C. conoidea Schk. Topeka. Popenoe.
 **C. alboluteus*. Topeka. Popenoe.

GRAMINEÆ.

- Alopecurus.
A. aristulatus Mx. Salina. J. Henry.
 Paspalum.
P. sanguinale Lam. Lawrence.
 Tricuspis.
T. acuminata. Dodge. Popenoe.
 Festuca, Fescue Grass.
F. tenella Willd. Topeka. Popenoe.
F. nutans Willd. Topeka. Popenoe.
 Poa.
P. trivialis. Leavenworth. Wherrell.
 Brizopyrum.
B. spicatum Hook. W. Kansas. Popenoe.
 Hordeum, Barley.
H. jubatum L. Irving. Miss E. C. W.
 Elymus, Wild Rye.
E. striatus Willd. Lawrence.
 Triticum, Wheat.
T. repens var. W. Kansas. Popenoe.
 Bouteloua.
B. hirsuta Lag. Dodge. Popenoe.
 Erianthus.
E. brevibarbis Mx. Irving. Miss E. C. W.
 Species, about 140; not in class book, 45.

Several species of grasses are not enumerated in this catalogue for want of time to determine them.

LAWRENCE, December, 1874.